

AMENDMENTS TO THE CLAIMS

This listing of claims will replace all prior versions, and listings, of claims in the application:

1 1. (Currently Amended) A method of preventing an attack on a network, the method
2 comprising the computer-implemented steps of:
3 receiving an ICMP packet ~~that includes~~, wherein a data field within the ICMP packet
4 includes a ~~copy~~ portion of a header associated with a connection in a
5 connection-oriented transport protocol, and wherein the portion of the header
6 includes a packet sequence value associated with the connection;
7 obtaining ~~[[a]]~~ the packet sequence value from the header;
8 determining if the packet sequence value is valid; and
9 responding to the ICMP packet by updating a parameter value associated with the
10 transport protocol connection only if the packet sequence value is determined
11 to be valid.

1 2. (Currently Amended) A method as recited in Claim 1, wherein the step of receiving
2 an ICMP packet comprises receiving an ICMP packet that includes a ~~copy~~ portion of a TCP
3 header associated with a TCP connection.

1 3. (Original) A method as recited in Claim 1, wherein the step of receiving an ICMP
2 packet comprises receiving an ICMP “endpoint unreachable” error packet.

1 4. (Original) A method as recited in Claim 1, wherein the step of receiving an ICMP
2 packet comprises receiving an ICMP packet that specifies that fragmentation is needed.

1 5. (Original) A method as recited in Claim 1, wherein the step of determining if the
2 packet sequence value is valid comprises determining if the packet sequence value is within a
3 range of packet sequence values that are allowed by the transport protocol for the connection.

1 6. (Original) A method as recited in Claim 1, wherein the step of determining if the
2 packet sequence value is valid comprises determining if the packet sequence value is within a
3 range of sent but unacknowledged TCP packet sequence values for the connection.

1 7. (Original) A method as recited in Claim 1, wherein the step of determining if the
2 packet sequence value is valid comprises determining if the packet sequence value is exactly
3 equal to one or more sequence values of one or more packets that are then-currently stored in
4 a TCP re-transmission buffer, starting at a sequence value of a previously sent segment that
5 resulted in receiving the ICMP packet.

1 8. (Original) A method as recited in Claim 1, wherein the steps are performed in a
2 router acting as a TCP endpoint node.

1 9. (Original) A method as recited in Claim 1, wherein the steps are performed in a
2 firewall device.

1 10. (Currently Amended) A method of preventing an attack on a network, the method
2 comprising the computer-implemented steps of:
3 receiving, at a TCP endpoint node in a TCP/IP packet-switched network, an ICMP
4 packet that includes a ~~copy~~ portion of a TCP header associated with a TCP
5 connection;
6 obtaining a packet sequence number from the portion of the TCP header;
7 determining if the packet sequence number is valid; and
8 responding to the ICMP packet by updating a maximum transmission unit (MTU)
9 value associated with the TCP connection only if the packet sequence number
10 is determined to be valid.

1 11. (Original) A method as recited in Claim 10, wherein the step of receiving an ICMP
2 packet comprises receiving an ICMP "endpoint unreachable" error packet.

- 1 12. (Original) A method as recited in Claim 10, wherein the step of receiving an ICMP
2 packet comprises receiving an ICMP packet that specifies that fragmentation is needed.
- 1 13. (Original) A method as recited in Claim 10, wherein the step of determining if the
2 packet sequence number is valid comprises determining if the packet sequence number is
3 within a range of TCP packet sequence numbers that are allowed for the connection.
- 1 14. (Original) A method as recited in Claim 10, wherein the step of determining if the
2 packet sequence value is valid comprises determining if the packet sequence number is
3 within a range of sent but unacknowledged TCP packet sequence values for the connection.
- 1 15. (Original) A method as recited in Claim 10, wherein the step of determining if the
2 packet sequence value is valid comprises determining if the packet sequence number is equal
3 to one or more sequence numbers of one or more packets that are then-currently stored in a
4 TCP re-transmission buffer, starting at a sequence value of a previously sent segment that
5 resulted in receiving the ICMP packet.
- 1 16. (Original) A method as recited in Claim 10, wherein the steps are performed in a
2 router acting as a TCP endpoint node.
- 1 17. (Original) A method as recited in Claim 10, wherein the steps are performed in a
2 firewall device.

1 18. (Currently Amended) A computer-readable medium carrying one or more sequences
2 of instructions, which instructions, when executed by one or more processors, cause the one
3 or more processors to ~~carry out the steps of any of claims 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12,~~
4 ~~13, 14, 15, 16, or 17~~ perform the steps of:

5 receiving an ICMP packet, wherein a data field within the ICMP packet includes a
6 portion of a header associated with a connection in a connection-oriented
7 transport protocol, and wherein the portion of the header includes a packet
8 sequence value associated with the connection;

9 obtaining the packet sequence value from the header;

10 determining if the packet sequence value is valid; and

11 responding to the ICMP packet by updating a parameter value associated with the
12 transport protocol connection only if the packet sequence value is determined
13 to be valid.

1 19. (Currently Amended) Apparatus for preventing an attack on a network, comprising:
2 means for receiving an ICMP packet ~~that includes,~~ wherein a data field within the
3 ICMP packet includes a ~~copy~~ portion of a header associated with a connection
4 in a connection-oriented transport protocol, and wherein the portion of the
5 header includes a packet sequence value associated with the connection;
6 means for obtaining [[a]] the packet sequence value from the header;
7 means for determining if the packet sequence value is valid; and
8 means for responding to the ICMP packet by updating a parameter value associated
9 with the transport protocol connection only if the packet sequence value is
10 determined to be valid.

1 20. (Currently Amended) An apparatus as recited in Claim 19, wherein the means for
2 receiving an ICMP packet comprises means for receiving an ICMP packet that includes a
3 ~~copy~~ portion of a TCP header associated with a TCP connection.

1 21. (Original) An apparatus as recited in Claim 19, wherein the means for receiving an
2 ICMP packet comprises means for receiving an ICMP "endpoint unreachable" error packet.

1 22. (Original) An apparatus as recited in Claim 19, wherein the means for receiving an
2 ICMP packet comprises means for receiving an ICMP packet that specifies that
3 fragmentation is needed.

1 23. (Original) An apparatus as recited in Claim 19, wherein the means for determining if
2 the packet sequence value is valid comprises means for determining if the packet sequence
3 value is within a range of packet sequence values that are allowed by the transport protocol
4 for the connection.

1 24. (Original) An apparatus as recited in Claim 19, wherein the means for determining if
2 the packet sequence value is valid comprises means for determining if the packet sequence
3 value is within a range of sent but unacknowledged TCP packet sequence values for the
4 connection.

1 25. (Original) An apparatus as recited in Claim 19, wherein the means for determining if
2 the packet sequence value is valid comprises means for determining if the packet sequence
3 value is equal to one or more sequence values of one or more packets that are then-currently
4 stored in a TCP re-transmission buffer.

1 26. (Original) An apparatus as recited in Claim 19, comprising a router acting as a TCP
2 endpoint node.

1 27. (Original) An apparatus as recited in Claim 19, comprising a firewall device.

1 28. (Currently Amended) A network element, comprising:
2 a network interface that is coupled to a data network for receiving one or more packet flows
3 therefrom;
4 a processor;
5 one or more stored sequences of instructions which, when executed by the processor, cause
6 the processor to ~~carry out the steps of any of claims 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14,~~
7 ~~15, 16, or 17~~ perform the steps of:
8 receiving an ICMP packet, wherein a data field within the ICMP packet includes a
9 portion of a header associated with a connection in a connection-oriented
10 transport protocol, and wherein the portion of the header includes a packet
11 sequence value associated with the connection;
12 obtaining the packet sequence value from the header;
13 determining if the packet sequence value is valid; and
14 responding to the ICMP packet by updating a parameter value associated with the
15 transport protocol connection only if the packet sequence value is determined
16 to be valid.

1 29. (New) A network element as recited in Claim 28, wherein the step of receiving an
2 ICMP packet comprises receiving an ICMP packet that includes a portion of a TCP header
3 associated with a TCP connection.

1 30. (New) A network element as recited in Claim 28, wherein the step of receiving an
2 ICMP packet comprises receiving an ICMP "endpoint unreachable" error packet.

1 31. (New) A network element as recited in Claim 28, wherein the step of receiving an
2 ICMP packet comprises receiving an ICMP packet that specifies that fragmentation is
3 needed.

1 32. (New) A network element as recited in Claim 28, wherein the step of determining if
2 the packet sequence value is valid comprises determining if the packet sequence value is
3 within a range of packet sequence values that are allowed by the transport protocol for the
4 connection.

1 33. (New) A network element as recited in Claim 28, wherein the step of determining if
2 the packet sequence value is valid comprises determining if the packet sequence value is
3 within a range of sent but unacknowledged TCP packet sequence values for the connection.

1 34. (New) A network element as recited in Claim 28, wherein the step of determining if
2 the packet sequence value is valid comprises determining if the packet sequence value is
3 exactly equal to one or more sequence values of one or more packets that are then-currently
4 stored in a TCP re-transmission buffer, starting at a sequence value of a previously sent
5 segment that resulted in receiving the ICMP packet.

1 35. (New) A network element as recited in Claim 28, wherein the steps are performed in
2 a router acting as a TCP endpoint node.

1 36. (New) A network element as recited in Claim 28, wherein the steps are performed in
2 a firewall device.